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ABSTRACT

This article discusses the symptoms and causes of math anxiety, and preventative measures that teachers can use to alleviate the stress some students experience in mathematics problem solving. Mathematics anxiety is defined as "feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations." The symptoms of math anxiety can include nausea, a hot tingling feeling, extreme nervousness, an inability to hear the teacher, a tendency to become upset by noises, an inability to concentrate, negative self-talk, a stomach ache, and sweaty palms. Causes of math anxiety may include underpreparedness, school absences, parents perpetuating the myth that math ability is hereditary, and negative past experiences with teachers. The Mathematics Anxiety Rating Scale (MARS) is a 98-item survey, sometimes shortened in length by teachers, which has been used extensively at the college, high-school and middle-school levels as a means of measuring mathematics anxiety. Instructors can improve students' confidence and performance by: (1) being mindful of their students' feelings; (2) introducing humor into the classroom setting; (3) sustaining enthusiasm for the subject matter; and (4) motivating students to change pessimistic learning styles to optimistic ones. The appended Mathematics Anxiety Scale is a ten-question student survey. (Contains 11 references) (AS)

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Mathematics Anxiety and the Underprepared Student

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Mathematics Anxiety and the Underprepared Student

Instructors have observed students in mathematics classes who possess an extreme amount of fear and negative feelings about the subject. These students are said to have a condition known as mathematics anxiety. Mathematics anxiety has been defined as "feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations (Richardson & Suinn, 1972, p.551)." Interfere is an understatement. These feelings can cause the student to become physically ill! They can cause the student's thought processes to become literally frozen with the result being that the student gives up. Math anxiety can be controlled and instructors need to know how to recognize math anxious students and to be aware of the tools available to help the math anxious student to overcome this impediment to learning.

The symptoms of math anxiety can include nausea, a hot tingling feeling, extreme nervousness, inability to hear the teacher, easily upset by noises, inability to concentrate, negative self-talk, stomachache, mind goes blank, and sweaty palms to name just a few (Kitchens, 1995, p. 6&7). The aspect of self-talk in the previous listing may need some

clarification. Tobias (1993) defines self-talk as "what we say to ourselves when we are in trouble" (p. 69). Negative self-talk can be the root cause of math failure in some students. When encountering a math problem, if the student is constantly saying to himself, "I can't do this math. I never have been good at math. I'm so dumb - I just can't do this..." then the student probably will not be able to work the problem simply because he talked himself into failure.

What causes mathematics anxiety? The causes are many and varied. The underprepared student population seems to be a breeding ground for mathematics anxiety. And mathematics anxiety could possibly be the root cause of the student's being underprepared - a vicious cycle. As Norwood (1994) states: "Mathematics anxiety does not appear to have a single cause. It is the result of different factors such as an inability to handle frustration, excessive school absences, poor self concept, parental and teacher attitudes toward mathematics, and emphasis on learning mathematics through drill without understanding."

Because mathematics is cumulative, excessive school absences cause students to get behind. Unless the student has a very conscientious teacher, extremely concerned parents, or a natural inquisitiveness without fear of asking questions, the student may never catch up. Or perhaps the

student wasn't absent but just missed something along the way. "One of the reasons students don't ask enough questions when they are younger is that they are either afraid of appearing too dumb in class or they fear appearing too smart" (Tobias, 1993, p. 62). No one wants to be classified as a dummy or as a nerd!

Parents perpetuating the myth that mathematical ability is inborn or hereditary may also be a contributing factor to math anxiety. Since they weren't good at math, then they don't expect their child to be good at it. Some parents feel that if their child receives bad grades in math it's because the child just doesn't have a mathematical mind. The "either you've got it or you don't" mentality. Another myth that seems to be widely accepted is that boys are better at math than girls are. These myths need to be exposed and dispelled. Success in mathematics depends more on hard work than on ability. (Moving beyond myths, 1991)

Anxiety could also be the result of a bad experience with a past teacher. I will never forget my daughter, Sandy, becoming physically ill over the weekly math fact test in her third grade class. The teacher was covering multiplication and insisted that the students know their multiplication tables perfectly. Every Friday the teacher gave a timed, 50 fact test. Whether the students missed one fact or all 50

facts, she made them write off their multiplication tables two through twelve. The following week, they had to write their tables twice if they missed one or more facts. This continued with the number of times increasing each week. After the third week, my daughter would begin to get sick to her stomach on Wednesday. She knew her multiplication tables backwards and forwards but the pressure of the timed test and knowing that she would have to write off if she missed just one fact, ruining her whole weekend (she felt), was making her physically sick. At the end of the fifth week I had had enough and confronted the teacher. I asked her if she didn't think it unreasonable to make the students write off the entire 2 through 12 tables when they only missed one fact? Wouldn't it be better to have the students write off the fact they missed? I also told her that I felt that the consequences of a test should be the grade received on the test. She said that she had been proceeding in this manner for 12 years and I was the first parent to complain! She said many of the students looked forward to the challenge but if my daughter was becoming sick over it she certainly wouldn't make her write off. I told her that I didn't want Sandy singled out as not having to write off when it was required of the rest of the class. The teacher assured me that it would be between her and Sandy and no one else need

know. I left feeling uneasy about the whole situation until Sandy came home the next Friday and said that nobody had to write off if they missed a fact! I was so relieved but imagine how many students were adversely affected by the unreasonable demands of this teacher over the previous twelve years!

"Teachers who do not realize the level of abstraction of the material they are presenting, often overestimate a student's ability to follow the discussion, then blame the student when problems arise" (Miller & Mitchell, 1994).

The revised Standards of teaching elementary and secondary mathematics which was published in 1989 by the Mathematics Association of America and the National Council of Teachers of Mathematics shows a valiant attempt to improve teaching and revise curriculum radically in the direction of more useful and usable mathematics. When these standards are adopted by schools and teachers much of the trauma and mindless drill that characterized math teaching in the past could be eliminated. (Tobias, 1993, p.38)

Can math anxiety be measured? The Mathematics Anxiety Rating Scale (MARS) is a 98 item survey. Because of its length researchers have turned to the Mathematics Anxiety Scale (MAS) which was adapted by Betz (1978) from the Anxiety subscale of the Fennema-Sherman Mathematics Attitudes Scales

(Fennema & Sherman, 1976). The MAS consists of 10 items with the first 5 items positively worded and the last 5 items negatively worded (see Appendix). If the positively worded items are reversed for scoring, then a high score will indicate high anxiety. The MAS has been used extensively at the college, high school, and middle school levels. Teachers may wish to use this survey to assess the degree of mathematics anxiety in their student population.

Math teachers need to be mindful of the feelings of their students and seek to build confidence in the student's ability to do mathematics. We should try to accomplish student understanding of mathematics by using a variety of procedures and materials in our classrooms. Manipulatives can sometimes open the eyes of a student to math concepts previously not understood because of that student's learning style. "Teachers who do not realize the level of abstraction of the material they are presenting, often overestimate a student's ability to follow the discussion, then blame the student when problems arise" (Miller & Mitchell, 1994). Teachers of mathematics need to learn not only the mathematics that they teach but also interesting methods of delivery and useful applications of mathematical concepts which may alleviate anxieties and entice the student to pursue mathematical studies.

Introducing humor into the classroom setting can be extremely advantageous in the learning of mathematics. The use of humor in teaching benefits students by reducing anxiety and facilitating learning. Mathematical cartoons, jokes, puns, riddles, stories, and even certain spontaneous behaviors that contain unexpected or out of context elements become memorable events in the minds of students. Humorous examples can promote comprehension and serve as cues for recalling information for tests during the term, as well as for long-term retention (Baker, 1995).

Instructors that are enthusiastic about the subject and really try to make math fun will have more success with student comprehension. Students will also find themselves looking forward to math class rather than dreading a dull presentation of mathematical facts.

"The most important step, once in the classroom, is to motivate the student and change pessimistic explanatory styles to optimistic ones" (Wieschenberg, 1994). Giving partial credit on tests where the student's grade is weighted more heavily on the process rather than the exact answer will build confidence and help students feel good about their accomplishments. Comprehension exercises of one problem worked by students at the end of a class session and checked by the instructor before the next class meeting inform the

instructor which students did not understand what was being presented. These exercises give students needed feedback and encouragement without the threat of receiving a bad grade. It is extremely important to foster positive attitudes about mathematics. Negative attitudes perpetuate math anxiety.

When an instructor realizes that a student has an extreme case of math anxiety a strategy of intervention should begin. The instructor may want to invite the student to make an appointment so the situation can be discussed or possibly the instructor can refer the student to a counselor that is well versed in dealing with such cases and is not also afflicted with math anxiety. Providing the student with a self-help manual such as Defeating Math Anxiety by Anita Navarte Kitchens might help. Sometimes math anxious students do better on a Math test if they are not tested in class with the other students. The instructor may also want to consider arranging special tutoring sessions and using alternative methods of evaluating the student (Miller & Mitchell, 1994).

Math teachers that show their students a sincere, caring attitude by working to help the student to overcome this terrible impediment to learning will not soon be forgotten by these students. And the teacher's sense of personal fulfillment at seeing her once math anxious student graduate is beyond description. It may take much planning and extra

time on the part of the instructor but it's worth it!

References

Baker, M. L. (1995). Cartoons, jokes and other humorous elements to liven your mathematics lecture. TNADE Conference handout.

Betz, N. E. (1978). Prevalence, distribution, and correlates of math anxiety in college students. Journal of Counseling Psychology, 25, 441-448.

Fennema, E., & Sherman, J. A. (1976). Fennema-Sherman Mathematics Attitude Scales: Instruments designed to measure attitudes toward the learning of mathematics by females and males. JSAS Catalog of Selected Documents in Psychology (No. 1225), 6, 31.

Kitchens, N. K. (1995). Defeating Math Anxiety. Chicago, Il.: Irwin Career Education Division.

Miller, L. D. & Mitchell, C. E. (1994). Mathematics anxiety and alternative methods of evaluation. Journal of Instructional Psychology, 21(4), 353 - 358.

Moving beyond myths, revitalizing undergraduate mathematics. (1991) Notices of the American Mathematical Society, 38(6), 547 - 552.

Norwood, K. S. (1994). The effect of instructional approach on mathematics anxiety and achievement. School Science and Mathematics, 94(5), 248 - 254.

Pajares, F., & Urdan, T. (1996). Exploratory factor

analysis of the Mathematics Anxiety Scale. Measurement and Evaluation in Counseling & Development, 29(1), 35 - 47.

Richardson, F. C., & Suinn, R.M. (1972). The mathematics anxiety rating scale: Psychometric data. Journal of Counseling Psychology, 19, 551 - 554.

Tobias, S. (1993). Overcoming Math Anxiety (Rev. ed.). New York, N.Y.: Norton.

Wieschenberg A.A. (1994). Overcoming conditioned helplessness in mathematics. College Teaching, 42(2), 51 - 54.

Appendix

Mathematics Anxiety Scale

1. It wouldn't bother me at all to take more math classes.
2. I have usually been at ease during math tests.
3. I have usually been at ease in math courses.
4. I usually don't worry about my ability to solve math problems.
5. I almost never get uptight while taking math tests.
6. I get really uptight during math tests.
7. I get a sinking feeling when I think of trying hard math problems.
8. My mind goes blank and I am unable to think clearly when doing mathematics.
9. Mathematics makes me feel uncomfortable and nervous.
10. Mathematics makes me feel uneasy and confused.